OULUN YLIOPISTO
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Mobile app to support cancer patients – caregivers' view

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Abstract

Mobile healthcare systems that support patients' treatments have become more common in recent years. The purpose of this study was to find out how health care professionals experience the use of the AforCP mobile application when monitoring the breast cancer patients' wellbeing, the assessment of the symptoms, the side effects of the treatments, and how the implementation of the application was experienced. The AforCP is a mobile application that allows cancer patients to determine their own health status and independently monitor their symptoms. In addition, cancer clinics can monitor the well-being of their patients and evaluate how the symptoms of the patients are developing in real-time.

The study was carried out at a Finnish university hospital, where the AforCP information system had been in pilot use for about nine months. The study was conducted as a qualitative case study and the research material was collected from the theme interviews made to five health professionals including doctors and nurses. The content analysis was used to analyse the content of the interviews.

Earlier studies have, among other things, demonstrated that patient-reported outcome systems may help communication between the patients and healthcare professionals and they may even prolong the survival time of cancer patients. Additional research was needed to gain insight into how the healthcare professionals perceived the AforCP system when following the patients' healthcare.

Healthcare professionals experienced that the AforCP reduced phone calls from the patients and the side effects of the treatments were received earlier. The patients were able to record information about their wellbeing at a time appropriate for them. They did not have to remember all important things when visiting a doctor and using a completely new drug. The healthcare professionals believed that the system could give a better picture of possible side effects than if it had been run without this system. The implementation of the AforCP system turned out to be a challenge. The interviewed healthcare professionals felt that the pilot project did not go as it was originally planned. Due to the small number of patients as users of the application the staff did not reach sufficient routine in using it. Some of them would have needed more training in the introduction phase. The integration into the main patient information system however would have reduced double recordings and saved working time from them.

It is important to pay attention to the planning and implementation of the pilot project in which patient's wellbeing is monitored so that users' attitudes towards the use of the system could be as positive as possible. Health care professionals are especially looking for systems that could offer them savings in work time and give them a clear picture of how their patients are doing.

Keywords
patient-reported outcome systems, implementation, user experience, user acceptance, cancer patient, qualitative research, theme interview, context analysis

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Tiivistelmä

Terveydenhuollon mobiilijärjestelmät ovat yleistyneet viimeisten vuosien aikana potilaiden hoidon tukena. Tämän tutkimuksen tarkoituksena oli selvittää, miten terveydenhuollon ammattilaiset kokivat AforCP mobiilisovelluksen käytön potilaiden hoidon tukena heidän voinnin ja hoidon haittavaikutusten seurannassa. AforCP on mobiilijärjestelmä, jonka avulla syöpäpotilaat voivat itse määrittää terveydentilansa ja monitoroida itsenäisesti oireitaan. Lisäksi syöpäpotilaita hoitavat klinikat voivat seurata potilaidensa hyvinvointia ja arvioida potilaiden oireiden kehittymistä reaaliaikaisesti.

Tutkimus toteutettiin suomalaisessa yliopistosairaalassa, jossa AforCP tietojärjestelmä oli ollut pilottikäytössä noin yhdeksän kuukauden ajan. Tutkimus tehtiin laadullisena tapaustutkimuksena ja tutkimusmateriaali kerättiin teemahaastatteluilla terveydenhuollon ammattilaisilta, lääkäreiltä ja sairaanhoitajilta. Haastateltavia terveydenhuollon ammattilaisia oli viisi. Haastattelujen sisällön analyysimenetelmänä käytettiin sisällönanalyysiä.

Aikaisemmat tutkimukset ovat mm. osoittaneet itseraportointijärjestelmien parantavan potilaiden ja lääkärin kommunikaatiota ja jopa pidentävän syöpäpotilaiden elossa-oloaikaa. Lisätutkimusta tarvittiin, jotta saatiin tietoa siitä, miten terveydenhuollon ammattilaiset kokivat AforCP-järjestelmän käytön potilaiden voinnin ja haittavaikutusten seurannassa. Lisäksi tavoitteena oli saada tietoa järjestelmän käyttöönotosta.

Terveydenhuollon ammattilaiset kokivat, että AforCP vähensi puheluita potilailta. He saivat hoitojen sivuvaikutukset tietoonsa aikaisemmin. Potilaat pystyivät kirjaamaan vointinsa seurantaan liittyviä tietoja heille sopivana ajankohtana. Potilaiden ei tarvinnut muistaa asioita lääkärikäynnillä ja käyttäessään täysin uutta lääkettä, terveydenhuollon ammattilaiset olettivat, että järjestelmä voisi antaa paremmin kuvan mahdollisista sivuvaikutuksista, kuin jos olisi toimittu ilman järjestelmää. AfoCP-järjestelmän käyttöönotossa koettiin olleen kohtuullisen paljon haasteita. Haastatellut terveydenhuollon ammattilaiset kokivat, ettei pilottiprojekti sujunut alkuperäisten suunnitelmien mukaan. Koska potilasmäärä oli pieni, henkilökunnalle ei syntynyt riittävää rutiinia järjestelmän käyttöön. Osa heistä olisi toivonut saavansa enemmän koulutusta käyttöönottovaiheessa. Integraatio potilastietojärjestelmään olisi vähentänyt moninkertaista kirjaamista ja säästänyt työaikaa.

Potilaiden voinnin seurantaan käytettävien mobiilijärjestelmien käyttöönottoprojektin suunnitteluun, resursointiin ja toteutukseen on tärkeää kiinnittää huomiota, jotta käyttäjien asenteet järjestelmän käyttöä kohtaan voisivat olla mahdollisimman positiiviset Terveydenhuollon ammattilaiset hakevat järjestelmiltä erityisesti työajansäästöä ja selkeää kuvaa potilaan voinnista.

Avainsanat
patient-reported outcome systems, implementation, user experience, user acceptance, cancer patient, qualitative research, theme interview, context analysis

Ohjaaja
FT, yliopistonlehtori ja dosentti Raija Halonen

Foreword

After several eventful months the completion of the master`s thesis is at hand. This work process has been very instructive not only academically but also at a personal level. I have found the subject of this thesis professionally very interesting and I still feel great enthusiasm to learn more about the subject.

I would like to thank all those people who have helped me in this work. First of all, I would like to express my thanks to the management as well as the doctors and nurses of the cancer centre for allowing me to make the interviews for this research work. I am also very grateful to my employer for enabling me to study alongside my work.

Perhaps the most important person in the completion of my thesis has been my supervisor, Raija Halonen, who I want to thank very warmly for her important instructions and advice. Her positive attitude and stimulating way of guiding were of crucial importance to the completion of my work.

I would also like to thank my parents for their wise advice and meaningful discussions on the topic of my work. They were always ready to help me. I would also like to thank my friends for their sympathy and encouragement for the study. Finally, I would like to thank Kimmo and my daughters, Jessica and Jenny, for being able to support me and understand that studying takes time and requires energy.

Thank you very much for everyone!

Anna-Mari Laitio

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Contents

1. Introduction

The purpose of the study was to find out how healthcare professionals experience the use of an application (called AforCP in this study) when monitoring their breast cancer patients' wellbeing, assessment of symptoms and side effects of treatment. Also, the purpose was to get information of the healthcare professionals' experiences of the utilising AforCP mobile application in the pilot project in the Cancer Centre of the City University Hospital (called City University Hospital in this study).

This study focused on AforCP patient-reported outcome system, which had been proposed to be taken into use in the Cancer Centre of a Finnish university hospital. Scientific research was needed to get topical knowledge about its use and how they are experienced by healthcare professionals in the hands of end-users and related actors. The pilot implementation for breast cancer patients started in February 2017 and continued until the end of the year. AforCP was to be piloted Due to the newness of the characteristics and functionality of AforCP there was only humble knowledge at hand, however, in general patient-reported outcome was reported in earlier research.

AforCP was a mobile application in which cancer patients could independently monitor their symptoms and cancer clinics could follow their patients` wellbeing and assessment of symptoms in real time. Breast cancer patients were able to use AforCP with mobile device at their home. Healthcare professionals who treated them had an interface and they were able to assess the symptoms and answer the questions their patients had raised between the treatments.

Recent studies showed that patient-reported outcome systems help identify and track patients' symptom progression (Basch et al., 2017; Bennet, Jensen, & Basch, 2012; Kotronoulas et al., 2014). Routine collection of patient-report outcomes as part of cancer therapy and follow-up may positively impact the survival (Basch et al., 2017; Denis et al., 2017) and quality of life of cancer patients (Basch et al., 2016). This study was particularly timely as the recent study of Basch et al., 2017 and Denis et al. (2018) show. Systems like AforCP have been developed over the last few years (Jensen et al., 2014), and therefore their evaluation is important. Previous literature has not ascertained how healthcare professionals are approaching the use of such an application. In order to realize the benefits of past literature, professionals must have the desire to use these systems (Rahimi, Vimarlund, & Timpka, 2008; Oghuma, Libaque-Saenz, Wong, & Chang, 2016). This study was to help City University Hospital decide of the continuation of the AforCP system. This kind of system is worth studying also from the academic perspective and not only with a practical approach. On the other hand, also the pharmaceutical industry is interested in evaluating side effects of the treatments more deeply and the systems that can support that need.

To solve the research problem a research question was formulated: "How do healthcare professionals experience a mobile application as a supporting tool for healthcare of breast cancer patients and how did they experience the utilisation of the application?"

The main research question was answered with the help of three sub questions:
Sub question 1: How can the healthcare professionals follow breast cancer patients' wellbeing?
Sub question 2: How can the healthcare professionals follow breast cancer patients' assessment of symptoms and side effects of the treatments?

Sub question 3: How did healthcare professionals experience the utilisation of a mobile application in the pilot project?

The current exploratory study was conducted as a qualitative case study in which healthcare professionals were interviewed once during the pilot usage. Data was collected via theme interviews. The empirical research material was analysed with the help of content analysis.

The study concentrated on professionals' feelings of the benefits of the system rather than the overall benefits of the patient-reported outcome system. The professionals thought that there would be fewer phone calls from the patients than without using the AforCP. They get to know the side effects of the patients' treatments earlier. The patients are able to record the information of their wellbeing at a more suitable time for them. Patients do not have to remember everything at their hospital visit, and finally when using a completely new drug, the system could give a better picture of the possible side effect. This study did not reveal that communication between the patients and the professionals would have worked better, even though many previous studies strongly supported it. Also, the symptom assessment and understanding are missing from the results of this study.

The report continues as follows: Next, related work is presented. After that, the research approach is briefly described, followed by description of the study concept. The results are reported next, and the report ends with discussion and conclusive words.

2. Related work

This chapter presents the central concepts of this study. They are patient-reported outcome systems, implementation, user experience and user acceptance.

2.1 Patient-reported outcome systems

This chapter reviews quality of life measures, self-assessment forms and patient-reported outcome systems as they all have the same purpose. Quality of life measures and self-assessment forms have been manual questionnaires and later they were changed electronic and the name patient-reported outcome system has become the common name for them.

Patient-reported outcome systems provide data which is directly reported and completed by patients themselves. The systems have validated questionnaires and their data is standardized. They can be used to monitor the patient's function ability and wellbeing. (Fitzpatrick, Davey, Buxton, & Jones, 1998.) In addition, these patient-reported outcome systems are implemented so that they have user friendly interfaces for patients self-reporting (Bennet et al., 2012). Tool is able to help detecting more concerns in patients' health (Taenzer et al., 2000). Many of the electronic patient-reported outcome systems also have links to patients' clinical treatments such as summary reports of patients' medical reports and real time email-alarms for healthcare professionals when the patient is having urgent need for treatment (Bennet et al., 2012). Computerized screening tool to record quality of life data is effective in noticing patients' quality of life problems in clinical appointments (Detmar, Muller, Schornagel, Wever, & Aaronson, 2002; Taenzar et al., 2000). Many of these queries have been originally designed to monitor the effectiveness of therapy in clinical trials (Basch, Barbera, Kerrigan & Velikova, 2018; Fitzpatrick et al., 1998).

Patient-reported outcome systems make possible patients' participation in their own care. Patients can use the report system to inform the physicians of their state of health. (Bennet et al., 2012.) They can also improve physician's and patient's common decision-making (Rotenstein, Huckman, & Wagle, 2017). Based on Detmar et al. (2002), the quality of life survey showed that the emotional support received from the treating physicians is significant. The quality of life –questionnaires may have positive effect on emotional wellbeing of the patients. They are also able to help patients have better health related quality of life. (Basch, 2017; Velikova et al., 2004.) However, it is not seen that they would change patients' health behaviour during the usage of these self-assessment questionnaires (Chen, Ou, & Hollis, 2013; Marshall, Haywood, & Fitzpatrick, 2006). Despite of these good results from earlier researches, Valderas et al., (2008) stated in their systematic review that most studies showed that the effect of patient-reported outcomes was limited. Though, based on earlier studies, patients are willing to continue using these patients reported outcome systems in their routine care (Cleeland et al., 2011; Detmar et al., 2002; Velikova et al., 2010.) Also doctors hope that the quality of life expectancy meter would continue to be used regularly in routine care (Detmar et al., 2002).

Recent studies also show that patient-reported outcome systems improve patients' satisfaction to their care (Chen et al., 2013; Kotronoulas et al., 2014). In a study of an internet-based patient-provider communication system Lin, Wittevrongel, Moore,

Beaty, and Ross (2005) revealed that patient that can use internet portal to communicate with physician are more satisfied with overall care. In turn, according to Hilarius, Kloeg, Gundy, and Aaronson (2008), patient satisfaction or health related quality of life didn't change over time when using patient-reported outcome systems. Also based on Detmar et al. (2002), there is no significant variation in the patients' satisfaction. Based on Rotenstein et al. (2017) the use of patient-reported outcome system may also enhance physicians' satisfaction to their work.

Electronic patient-reported outcome systems make it possible to develop standard methods (Bennet et al., 2012) and practice (Trotti, Colevans, Setser, & Basch, 2007) and implementation in clinics (Bennet et al., 2012). They may provide efficacy and quality of patients' treatment (Bennet et al., 2012) and enhance workflow efficiency (Rotenstein et al., 2017). Based on 27 studies, Chen et al. (2013) showed that the connection to the patient-reported outcome systems are weak between patients care, they improve treatment results, efficiency of organisational quality improvement, transparency, openness, public reporting and the functioning of health care system. Though, Marshall et al. (2006) reviewed 38 studies that are related to usage of patients' self-assessment forms in primary care routine processes. According to their research, patients' self-assessment seems to have quite noticeable effect on some treatment processes like diagnosis and patients' treatment conditions. Positive impact is seen especially in detecting mental health problems in routine medical examinations (Bennet et al., 2012).

Earlier studies revealed that there is clear evidence that patient-reported outcome systems improve communication between patients and professionals who are responsible for their care (Bennet et al., 2012; Chen et al., 2013; Rotenstein et al., 2017; Santana & Feeny, 2014; Taenzer et al., 2000). They also improve physician's and patient's relationships by enabling the physician better to understand the patient's symptoms (Rotenstein et al., 2017). They enable patients to communicate about their health information with healthcare professionals, who are responsible for their treatment (Bennet et al., 2012; Kotronoulas et al., 2014; Takeuchi et al., 2011; Velikova et al., 2004) and they also increase the frequency of those discussions during the doctor visits (Kotronoulas et al., 2014). Patient-reported outcome systems do not eliminate the problem that the cancer therapist and the patient are not always able to communicate sufficiently about the patient's quality of life. An example of a difficult discussion topic is patient's fatigue, which can often be discontinued or replaced by a conversation with doctor. (Greenhalg, Abhyankar, McCluskey, Takeuchi, & Velikova, 2013.) According to Takeuchi et al. (2011), patient reported outcome systems support the patient-oncologist communication when discussing about patients' physical symptoms, but they don't make a change to the oncologists' difficulty in discussing with patients about the psychosocial impact of cancer and cancer treatments.

Based on Detmar et al. (2002), quality of life survey significantly increases the communication between the patient and the physician. All the doctors, in the cancer hospital, that were involved in their study and most of the patients felt that the quality of life expectance facilitated mutual communication between the patient and the doctor. Hilarius et al. (2008) noticed that health related quality of life –related topics were communicated more frequently when using quality of life survey before outpatient cancer treatment. Lin et al. (2005) studied internet-based patient-provider communication system and revealed that patient that can use internet portal to communicate with physician are more satisfied with patient physician communication. Patients think that the internet portal lowers the barriers that there are otherwise with

communication. They also think that portal is convenient way to communicate and they value physicians' direct responses to them.

Electronic patient-reported outcome systems have been used in cancer clinics and other clinics, as they save physicians time (Bennet et al., 2012; Rotenstein et al., 2017; Taenzer et al., 2000). Computerized screening tool to record quality of life data is able to help detecting more concerns in patients' health (Taenzer et al., 2000). Tool is effective in noticing patients' quality of life problems in clinical appointments (Detmar et al., 2002; Taenzar et al., 2000). Regularly collected patient-reported outcome data will improve patient management effectively (Trotti et al., 2007). Kelley, Kraft-Todd, Schapira, Kossowsky, and Ries (2014) studied the relationship between patients and clinicians and how it influences healthcare outcomes. Their meta-analysis shows that patient-clinician relationship has an effect to healthcare outcomes. The effect is rather small but statistically significant. Based on Detmar et al. (2002), quality of life survey improves the medical knowledge of the patient's problems. Hilarius et al. (2008) study also showed that nurses were more aware of patients' overall quality of life and there were significantly more marks in patients' medical records infer health related quality of life.

Electronic patient-reported outcome systems have been used in cancer clinics, as they make it possible to improve clinical care by showing important symptoms of the patients. They provide regular patients symptom tracking (Bennet et al., 2012) and improved symptom control (Kotronoulas et al., 2014). Electronic patient-reported outcome systems help identify and follow assessments of patients' symptoms (Bennet et al., 2012). Symptom monitoring is vital to identifying problems and planning patients' treatment (Trotti et al., 2007). According to Bennet, Jensen, and Basch (2012), patient-reporting outcome system reporting may include for example symptoms like nausea, fatigue, pain, pollakiuria and diarrhea. It may also include information about the physical activity of the person like walking in the stairs or fastening buttons and also about psychological function of the person like anxiety, fear and worry (Bennet et al., 2012). Professionals are able to follow-up better their patients' responses to their treatments and find more previously unrecognized problems than before patient-reported outcome systems' implementation (Chen et al., 2013).

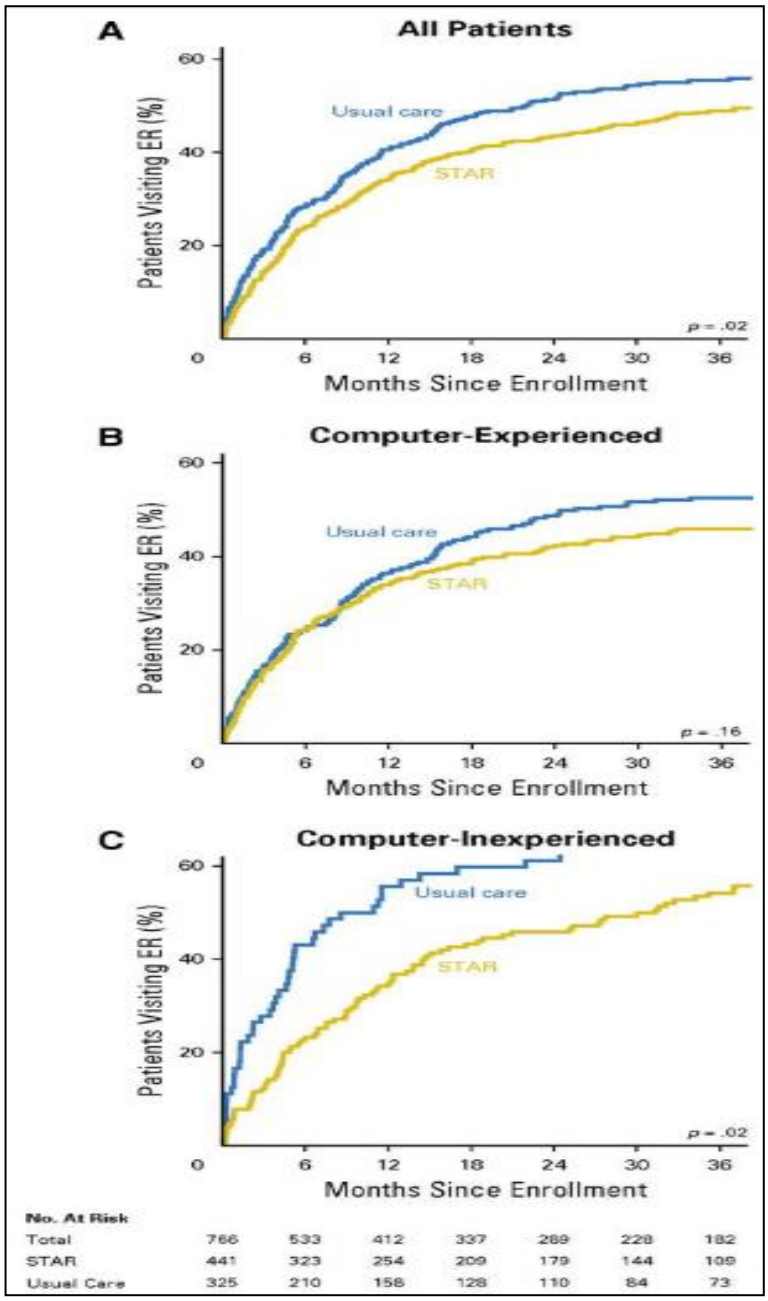

Figure 1. Emergency room visits during cancer treatment. (Basch et al., 2016, p. 563.)

Basch et al. (2016) showed in their study (Figure 1) how patient-reported outcome systems have also clinical benefits. Patients using web-based self-reporting system, Symptom Tracking and Reporting (STAR), have fewer cumulative emergency room visits than patients who have usual care with no symptom tracking and reporting system. Basch et al. (2016) randomly chose outpatients who had routine chemotherapy treatment of solid tumour. Outpatients' health-related quality of life (HRQL) improved in the intervention group more than in traditionally treated group. Intervention group patients had less emergency visits and treatment periods in hospital and they were able to be treated longer time with chemotherapy. Moreover, computer-inexperienced patients benefit more than computer experienced patients from electronic system. Computer-Inexperienced patients that didn't use this system had cumulatively more visits in emergency room during their cancer treatment than patients that used that system.

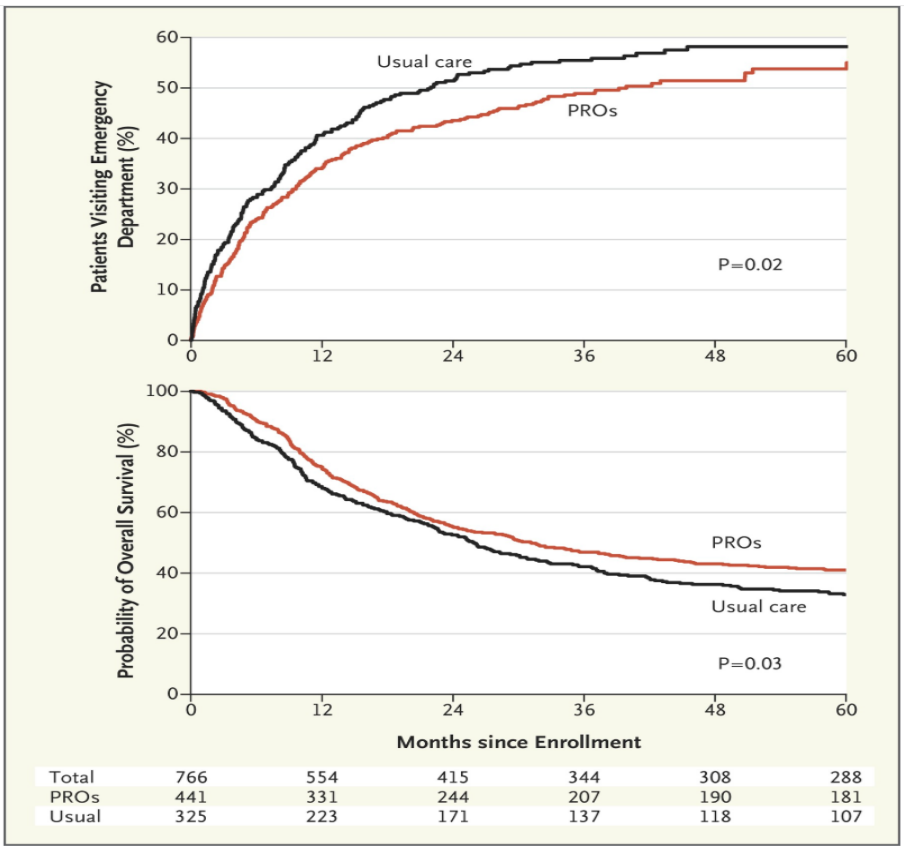

Figure 2. Emergency Department Visits and Probability of Survival (Basch et al., 2017, p. 106).

According to the further study of Basch et al. (2017), routine electronic follow ups of patients' symptoms as part of cancer care may have positive impacts on cancer patients' emergency visits and even on their survival. Median overall survival time during seven years follow up time is five months longer in the intervention group using patient-reported outcome system, than in the group whose patients are treated traditionally. Further, reason for the five months longer survival time is that side effects of treatments are recognized and treated in earlier stage. Longer lasting medication is possible in these cases. Figure 2 shows how patients that used patient-reported outcome system during their cancer care had fewer visits in emergency department than patients that had usual care with no use of that kind of system. The picture also shows that patients using the system have better probability of overall survival of cancer.

A recently published French randomized multicentre study of Denis et al. (2017) highlighted the benefits of patient-reported outcome system -tools in advanced lung cancer patients. The survival of the patients that used patient reported outcome system was 74,9% compared to control groups 48,5%. The number of CT images required for the patient reported outcome system enabled group was lower compared to the control group. This decreased the cost of the given treatment. Researchers thought that the longer life span was due to better monitoring of the patients and relapses recognized earlier. It was also noteworthy, that if the disease was diagnosed earlier and patients were in better condition, a more optimal treatment could be performed. Serious conditions such as pulmonary embolisms and pneumonia were detected with the patient-reported outcome system tool group faster than in the control group. According to Denis et al. (2018) surveillance of lung cancer patients using patient-reported outcome system is able to provide longer overall survival time. Median overall survival time for patients using the system was 23.0 month compared to 14.8 months without the system.

Based on the previous studies it can be expected that quality of life questionnaires or patient-reported outcome systems can help improve the efficiency and quality of care (Bennet et al., 2012; Chen et al., 2013), patients' treatment satisfaction (Chen et al., 2013; Kotronoulas et al., 2014; Lin et al., 2005), symptom assessment (Bennet et al., 2012; Chen et al., 2013; Kotronoulas et al., 2014) and symptom understanding (Rotenstein et al., 2017), emotional wellbeing of the patients (Velikova et al., 2004), patient management (Trotti et al., 2007) and communication between the patient and the healthcare professionals (Bennet et al., 2012; Chen et al., 2013; Detmar et al., 2002; Kotronoulas et al., 2014; Rotenstein et al., 2017; Santana & Feeny, 2014; Taenzer et al., 2000; Velikova et al., 2004). The systems may increase patients' participation on their own care (Bennet et al., 2012), improve common decision-making (Rotenstein et al., 2017) and it may also have impact on patient's health related quality of life (Basch et al., 2016; Velikova et al., 2004). Patient-reported outcome systems are also able to reduce emergency department use (Basch et al., 2016), decrease cost of treatment (Denis et al., 2017), foster healthcare professionals' medical knowledge of patients' conditions (Detmar et al., 2002; Hilarius et al., 2008; Taenzar et al., 2000), enhance workflow efficiency (Rotenstein et al., 2017) and save physicians time (Bennet et al., 2012; Rotenstein et al., 2017; Taenzer et al., 2000). Patients' serious conditions can be detected earlier (Basch et al., 2017; Denis et al., 2017) and they may even lengthen patients' overall survival time (Basch et al., 2017; Denis et al., 2017). Table 1 sums the patient-reported outcome systems perceived benefits.

Table 1. Summary of the identified patient-reported outcome systems perceived benefits.

Benefits	**References**
Efficiency of care	(Bennet et al., 2012; Chen et al., 2013.)
Quality of care	(Bennet et al., 2012; Chen et al., 2013.)
Treatment satisfaction	(Chen et al., 2013; Kotronoulas et al., 2014; Lin et al., 2005.)
Symptom assessment and understanding	(Bennet et al., 2012; Chen et al., 2013; Kotronoulas et al., 2014; Rotenstein et al., 2017.)
Emotional wellbeing	(Velikova et al., 2004.)
Patient management	(Trotti et al., 2007.)
Communication	(Bennet et al., 2012; Chen et al., 2013; Detmar et al., 2002; Kotronoulas et al., 2014; Rotenstein et al., 2017; Santana & Feeny, 2014; Taenzer et al., 2000; Velikova et al., 2004.)
Patients' participation	(Bennet et al., 2012.)
Common decision-making	(Rotenstein et al., 2017.)
Health related quality of life	(Basch et al., 2016; Velikova et al., 2004.)
Use of emergency department	(Basch et al., 2016.)
Cost of treatment	(Denis et al., 2017.)
Medical knowledge	(Detmar et al., 2002; Hilarius et al., 2008; Taenzar et al., 2000.)
Workflow efficiency	(Rotenstein et al., 2017.)
Save physicians time	(Bennet et al., 2012; Taenzer et al., 2000.)
Serious conditions detected earlier	(Basch et al., 2017; Denis et al., 2017)
Overall survival time	(Basch et al., 2017; Denis et al., 2017; Denis et al., 2018.)

Table 1 shows that some of the benefits have been reported in several different studies, such as communication. For some other benefits have been reported only in individual trials, such as costs of treatment and use of emergency department.

2.2 Implementation

The referred studies emphasize the commitment of the project organisation (Rahimi et al., 2008; Yucell, Cebi, Hoege, & Ozok, 2011) and organisational support in the implementation projects (Yano et al., 2012). Information system implementation should be carefully planned to avoid problems that could lead to failure or user resistance. The results achieved with the implementation of information systems are essentially dependent on the implementation process of the systems and their forms and methods. (Hyötyläinen & Kalliokoski, 2001.) The user involvement and commitment into the implementation process is needed for the success of the implementation project (Bansler & Havn, 2010; Berg, 2001; Rahimi et al., 2008; Yucel et al., 2011). The first implementation of the system only shows the first impressions, not the final success of

the system (Sherer, Myerhoefer, & Peng, 2016). According to Rotenstein et al. (2017) when the Patient-Reported outcome system is in use for the first time, it takes extra time from the users. It also adds an extra step to patients' workflows. The authors also noted other challenges such as problems with wireless networks and user interface. Professionals' displays must be intuitive and, in a place, where they are easy to access. Also, organisations must be ready to invest on technology and user training. (Rotenstein et al., 2017.)

The new information system becomes concrete after the implementation phase (Kettunen & Simons 2001). The health care organisations can only benefit from the system that their professionals use (Rahimi et al., 2008). According to Greenhalg, Long, and Flynn (2005) the impact of health-related quality of life data on clinical decision making can be maximized by bringing the substantive data to all the clinicians that are involved in the patients' care. The clinicians should also get the data in the format that they are familiar with (Greenhalg et al., 2005) and data should be integrated into clinical information (Greenhalgh, Long, & Flynn, 2005; Jensen et al., 2014).

According to Bansler and Havn (2010), suggestions for a successful health information system pilot implementation are firstly that there should be appropriate scope. Secondly, technology should be managed and made easy to use for organisations. Thirdly, it should be ensured that managers have a good commitment to that pilot implementation. (Bansler & Havn, 2010.) Also, managements support, financial recourses, organisations policies and practices and climate influence the way new innovation implementations are been used (Klein, Conn, & Sorra, 2011).

In addition, the implementation of the health information system is a very complicated task to do. There are always technical and organisational aspects, which must be solved simultaneously. (Berg et al., 2004.) The implementation of the electronic patient-reported outcome system requires well trained personnel and users. The planning of the implementation must be done carefully. (Basch, Barbera, Kerrigan, & Velikova, 2018; Bennet et al., 2012.) Barriers that doctors and nurses have in the implementation of the health outcome questionnaires in clinical practise are the lack of resources, not easily interpreted data and not enough knowledge of how to use the health outcome data (Meadows, Rogers, & Greene, 1998). Venkatesh and Davis (2000) noticed in their study that after the users are more experienced with the system, they don't mind what others think about the system.

Yucel et al. (2011) have studied the hospital information system implementation projects and have proposed the risk assessment model for it. In this model technological, organisational and individual risk factors are used in predicting the success of the information system implementation. According to that study, it is important to make detailed analyses of the impact and the new features of the system to control the risks of the system implementation. In this model risk factors are used in predicting information system implementation success. Firstly, they present technological factors which they say to be the most affective factors on implementing the health care information systems. Those factors are usefulness, compatibility, user involvement and ease of use. Secondly, they present organisational factors which are training and organisational commitment Thirdly, there are some individual factors in which the user's previous experience of the health care information systems is the most important one. The age and the gender of the users are the least important factors among the all risk factors. The enjoyment of health care information systems is also considered a less important risk factor. (Yucel et al., 2011.)

The success and efficiency of implementation of information systems are critical indicators for measuring the value and impact of information technology decisions and investments (DeLone & McLean, 2002). It is typical that the introduction of a new information system in an organisation is related to the change process that the new information system is intended to support. The implementation process itself may also cause changes in the organisation. (Robey, Ross, & Boudreau, 2002.) Information system projects are particularly vulnerable to failures (Keil, Cule, Lyytinen, & Schmidt, 1998). According to Keil et al. (1998) the three most important risk factors are commitment of the top management to the project, failure to commit the users, and incorrect understanding of the requirements. According to the recent article of Basch, Barbera, Kerrigan, and Velikova (2018), success of the implementation of patient-reported outcome systems is dependent on adequate resources, training, continuous monitoring and thoughtfully design and roll-out programs.

2.3 User experience

ISO 9241-210 (2010) standard of International organisation for standardization has defined the requirements of ergonomics of human-system interaction. It defines user experience as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service".

The users should get pleasure from using the product. They shouldn't get frustrated when trying to make some simple steps with the product. Earlier studies have shown that the interaction quality is one of the main things when defining the success of the product. (Pucillo & Cascini, 2014.) According to the study of Lallemand, Gronier, and Goenic (2015), half of the responders thought that the main reason why user experience is important is to design better products. In order to know the viability of the mobile system, users need to use the system continually (Oghuma et al., 2016).

Based on their review of 28 empirical studies, Hassenzahl and Tractinsky (2006) proposed that the facets of user experience can be divided into three perspectives, which are 'emotion and affect', 'beyond instrumental' and 'the experiential': Emotion and affect include subjective, positive, antecedents and consequences. Beyond instrumental include holistic more completed user experience, aesthetic like beauty of user experience and hedonic like increase of personal knowledge and skills. The experiential includes dynamic, complex, unique, situated and temporally-bounded. Law, Roto, Hassenzahl, Vermeeren, and Kort (2009) coordinated a survey for user experience practitioners and researchers. They asked questions related to three categories (user experience statements, user experience definitions and respondents' background). The results of their study indicated that according to the opinions of the respondents, the concept of user experience includes the terms dynamic, context-dependent and subjective. It seemed that the responders' working experience or place of work did not have significant impact on the results. Hassenzahl, Diefenbach, and Göritz (2010) identified popularity, competence, relatedness and stimulation as the most salient needs for pleasurable experience with technology. These needs were found in their study of sources of positive experiences with interactive products such as mobile phones and computers. Their study showed a clear link between need fulfilment and positive affect.

Rajanen et al. (2017) explored how user experience professionals from different parts of the world and different cultures experience the concept of user experience. They did the

survey among professionals in Finland, Turkey, France, Denmark and Malaysia and compared their opinions. Based on their study the concept of user experience is still developing and it has different views in different countries and among different user groups. Their study compared two different definitions: system-oriented and human-oriented. For example, the male gender and education level of the professional had impact on how the concept was understood. In Finland, user experience professionals preferred the human-oriented definition of user experience. (Rajanen et al., 2017.)

When measuring user satisfaction, you need to know about the users and what they are trying to accomplish. Are users obliged to use the system or whether it is voluntary. Do they use the system every day or less? It is crucial to understand what motivates the user to use the system. These questions measure users' experiences of system performance and satisfaction. (Tullis & Albert, 2008.)

2.4 User acceptance

Technology acceptance model was introduced by Davis in 1989. The model analyses perceived usefulness and ease of use of the system from the view of the users' subjective experience. The usefulness is analysed by the quality and the amount of the work. Easiness of use is analysed by the ability to learn to use the system, management of the system and by the mental burden of the use of the system. Model includes 12 dimensions. Half of them deals with the utility of the system and half of them the easiness of the use of the system. Technology acceptance model is one of the most used research models, when trying to figure out the users' attitude towards the technology and the use of it. (Haaparanta 2008, 70). Users in IBM laboratory and voluntary MBA-students both evaluated two different computer systems. He found quite clear connection between usefulness and usage. In turn, ease of use and usefulness didn't have that strong connection. This means that users may use a system that has functionalities that are critically needed even if there are some difficulties in using them. Users' attitudes towards new information systems are more positive if they think that they will benefit in their work from the use of the system and it will improve their performance in work. (Davis, 1989.)

Verkatesh and Davis (2000) added two new dimensions to Technology acceptance model: social influence processes and cognitive instrumental processes. They tested this model in four longitudinal studies in which they used four different research sites. Two of them had system implementation that was voluntary to users and in two of them the use was mandatory. The researchers found out that after the users were more experienced with the system, they didn't mind what others thought (social information) of perceived usefulness or intentions of use. They however judged the usefulness of the system if they got status benefit from it. In addition to the fact that the usefulness and ease of use in mandatory systems has been shown the usage intention was affected by subjective norm. (Verkatesh & Davis, 2000.) Perceived usefulness is a cognitive belief that is essential to technology acceptance (Davis, Bagozzi, & Warshwa, 1989) also in mobile healthcare context (Gefen, Karahanna, & Straub, 2003; Pavlou, 2003).

DeLone and McLean (1992) introduced the information systems success model that has been widely adopted in different studies since then. In their model they integrated the theory of communication introduced by Shannon and Wiever (1947) and the theory of information impact introduced by Mason in 1978. DeLone and McLean (1992) reviewed 180 studies and organised them in six different categories: system quality,

information quality, use, user satisfaction, individual impact and organisational impact. Accordingly, their success model proposed that information systems success is multidimensional. There is need to explore these different dimensions to get a clear picture of success. DeLone and McLean updated their model in 2002 and named it "The reformulated IS Success". They added service quality and net benefits in their model. Service quality is one of three quality taxonomies (system quality, information quality, and service quality). Net benefit is supposed to be positive, in order to make the system owner or sponsor satisfied with the system. The use of the system and the user satisfaction will lead to positive net benefit. (DeLone & McLean, 2002.)

Pai and Huang (2011) proposed a conceptual model of the intention of use of the healthcare information system. According to their model the perceived usefulness will be better if the quality of information is increased. They highlighted that sufficient information should be available, system interface should be well designed, and the information should always be updated. In their review article from 33 existing patient-reported outcome systems in cancer clinics Jensen et al. (2014) explained that the flexibility of the evaluation, its integration to clinical health record systems, high-quality reporting and data gathering are the main things to highlight when discussing the usability and acceptance of the system. Gefen, Rigdon, and Straub (2011) raised the issue that users lack the confidence and assurance if they don't have credibility to healthcare information system providers. The users need that confidence and assurance to be open to the new ideas of system providers. Users attitudes, behaviours and beliefs need long-term study in order to understand healthcare information system viability in the long run (Venkatesh, Thong, Chan, Hu, & Brown, 2011).

3. AforCP

AforCP is a patient-reported outcome system in which cancer patients can systematically report about their wellbeing between their hospital visits and after their treatment period. It is the mobile service that gives oncologist and nurses real-time view about their patients' conditions, as well as about the symptoms and side effects of the treatment. There are the algorithms that report the healthcare professionals about the symptoms and they tell them if the patient needs treatment or attention by the professionals. It emphasizes the acute symptoms of those patients who need urgent care. The system has got standardized questionnaires for patients which they have to fill in weekly or before each hospital visits. The system also has a messaging component for patients and healthcare professionals for their mutual communication. In addition, it can also be used as a digital diary which makes it possible for the professionals to get a picture of patient's wellbeing in long run. The AforCP can be integrated into the electronic patient record –system of the hospital. In this case, however, there was no integration into other electronic systems in the hospital.

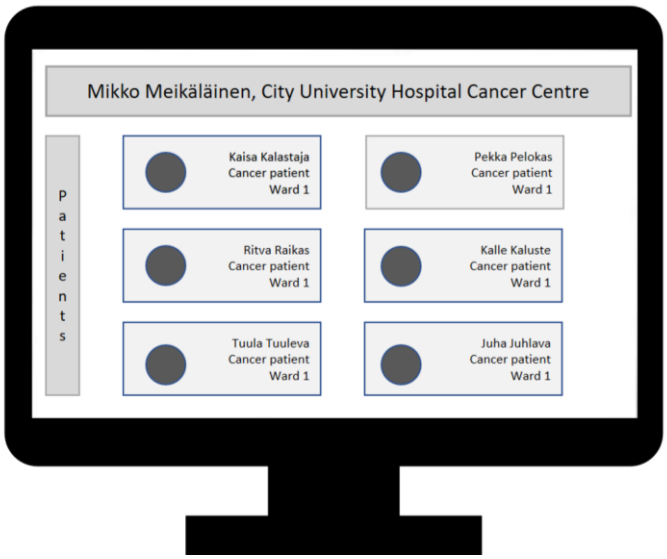

Figure 3. The AforCP: An imaginary example of the professionals' view.

Healthcare professionals are able to use the AforCP via web-browser (Figure 3) to support their work in the cancer clinic. In the professionals' view can be seen all the patients who have given reports about their symptoms during last few days. The patients' names and the ids are shown on the screen. The patients are ranked by algorithms of the system according to how severe their symptoms are. The professional then has access to the patient's information like symptom recordings and messages sent.

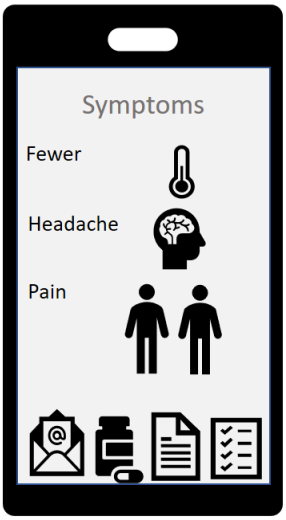

Figure 4. The AforCP: An imaginary example of the patients' view.

The patients can use mobile devices, tablet computer or desk computer. The patients' email addresses are needed to get the registration link into the system. With the mobile device (Figure 4) the patients have an easy access to the diary in which they can report the information about their wellbeing. They can do it when and where ever it suits them. Whit a help of a picture symbols on the screen the patient can give information about the pain. He can also mark the place in his body where he feels it. It is also possible to report in which situations he feels it and how intense it is. If he sees it necessary, he can send the information about his symptoms to the professionals in the clinic. The system itself can also give a notice to the patient if there is something alarming and demands immediate attention. The AforCP recommends the patient to take contact to the clinic. The system also allows the patient to send separate messages to his clinic.

4. Research approach

The purpose of this study was to find out how healthcare professionals experience the usage of the AforCP application when monitoring their patients' wellbeing, the assessment of symptoms and the side effects caused by the treatment. The purpose was also to get information of the healthcare professionals' experiences of the implementation of the AforCP mobile application in the pilot project in the Cancer Centre of the City University Hospital.

4.1 Method

This was a case study of the AforCP. The qualitative case study was selected as the research strategy, because there was requirement to understand the effects of implementation of the system for patient treatment (see Darke, Shanks, & Broadbent, 1998). A case study can be qualitative, quantitative or both (Yin, 2003). Qualitative case study is an approach that helps to identify phenomena in its own context (Baxter & Jack, 2008). It aims at analysing material to create generalizations (Gomm, Hammersley, & Foster, 2009). This case study is focusing to answer to the questions "why" and "how". The behaviour of the people who participate in the study cannot be manipulated. The contextual conditions are relevant to the phenomenon under study otherwise it is not clear what the boundaries between the phenomenon and the context of the study are. (Yin, 2003.) Many different data sources are characteristic to a case study research. The more data sources there are the better credibility of the study is. (Patton, 1990; Yin, 2003.)

According to Yin (2003), a case study might be explanatory, exploratory or descriptive. The explanatory case study is used to explain the causes and effects of real-life situations. The exploratory study is for the cases where the case being evaluated has no clear and one set of outcomes. The purpose of a descriptive case study is to describe the phenomenon or case in its real-world situation. Yin (2003) also divides the case studies into single and multiple case studies. The idea of the multiple case studies is to understand the differences and similarities of different cases. Stake (1995) in turn divides case studies into three different categories; intrinsic, instrumental and collective. The intrinsic approach is suitable for a researcher who wants to understand the case more deeply and is also more interested in the case itself. The instrumental approach gives an insight into an issue. The case itself is in a supportive role rather than the main interesting thing. The instrumental approach is not meant to be used when the purpose is to understand certain situation. The collective case study is considered to be the same as the multiple case study.

Interviews are one of the most common qualitative methods for collecting data. (Dicicco-Bloom & Crabtree, 2006). According to Alvesson (2003) there are three different methods used in research interviews. These theoretical perspectives are neopositivism, romanticism and localism. Neopositivism sees the interviewee as a truth teller and the interview as a tool for collecting objective data. Romanticism sees the interviewer as an empathetic listener who deeply understands the inner world of the interviewee. An interview where the interviewee is seen as a person who produces situated accounts rather than reports external events is named as localism. The issues are understood in the interviewees' own social contexts. (Alvesson, 2003.) The interviews

can be executed in groups or individually though especially sensitive topics are not recommended to be discussed in groups (Qu & Dumay, 2011).

In this exploratory single case study, the interviews were carried out individually, and the theme interviews were used as the data collection method (see Hirsjärvi & Hurme, 1998). The themes were chosen to get the information about different points of views concerning the experiences of using patient-reported outcome systems. The City University Hospital wanted to find out if their healthcare professionals like the use the system. The themes of the interviews were healthcare professionals' experiences of the AforCP use, patients' experiences of the use of the system told by the healthcare professionals and the implementation of the system. Data from the interviews were transcript into worksheet program and after that processed by content analysis method (see Cavanagh, 1997). The content analysis is a research method that helps to analyse the data (Hsieh & Shannon, 2005).

4.2 Data collection

The data for this research was collected by interviewing the health care professionals in the Cancer Centre of the City University Hospital. The interview questions of this study are in appendix A. When planning the research, this AforCP user organisation was chosen to because they had just started to use the AforCP software in hospital. Originally, they had decided to use it for eleven months as a pilot project. During that time, they were supposed to finally decide if they would continue using the system in the future. At this point the researcher inquired them if they wanted to be part of the project of this study. Along whit this it would be easier for them to decide whether to continue using the system or not.

The hospital management was asked for permission to carry out the research. The research plan was sent to the Research Council of the Hospital, which then had given the permission to start the study. The permission for the study was also asked from the AforCP system supplier. The research questions were examined together with the Chief Physician of the Cancer Centre; this way the questions would also give answers to their needs of implementation regarding the termination of usage of the system.

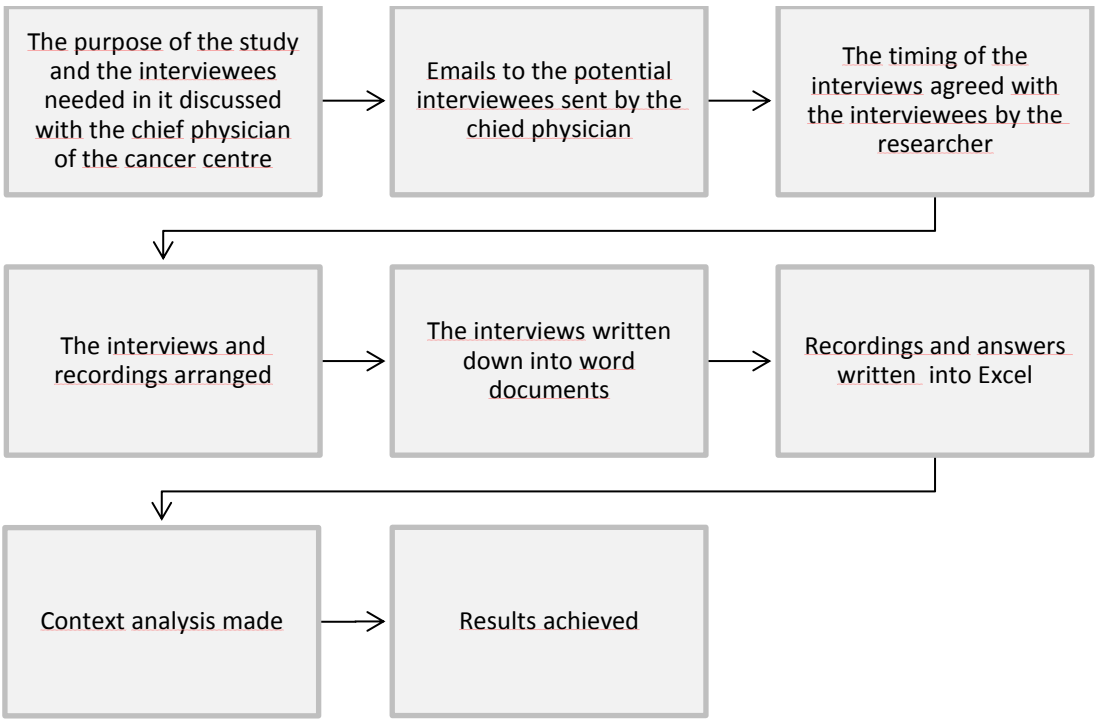

Figure 5. Gathering and analysing the data.

The interviews were planned to be carried out with two to three doctors and two to three nurses. As the Figure 5 shows, the management of the Cancer Centre of the City University Hospital first suggested the participants, after which the researcher agreed on the joint interviews with the interviewees. Finally, three doctors and two nurses were interviewed. This was enough to reach the required coverage. The interviews were conducted as theme interviews. The themes of the interviews were healthcare professionals' experiences of the use of the AforCP application, patients' experiences according to the professionals, and the system implementation.

All the interviews were carried out as planned at the times the interviewees had accepted and suited to their working hours and places of work. The interviews were conducted in November 2017, and each of them lasted for 25-35 minutes. They were recorded on a tablet computer. The interviews were semi-structured, i.e. the interviewer utilized pre-planned questions that were asked from all the of the interviewees in the same way. During the interview, the issues relevant to the research were highlighted by supplementary questions. There were no other people in the room except the interviewer and the interviewee involved in the study. At the beginning of the interview the interviewer introduced herself and the topic to be studied. The interviewees were also asked permission to record the interviews and they were informed about the fact that the material used in the study was to be handled confidentially. All the interviewees gave permission for recording.

Later on, all the interviews were listened to and transcribed into separate text documents. The transcription phase lasted for about a month. The data analysis was done by placing each question to an Excel table. All the answers of all the five interviewees were placed under each respective question for each question. At this point, it was tried to figure out what each interviewee had meant by his or her answer. Finally, all the interviewees' answers into each question were interpreted with one summarized thought.

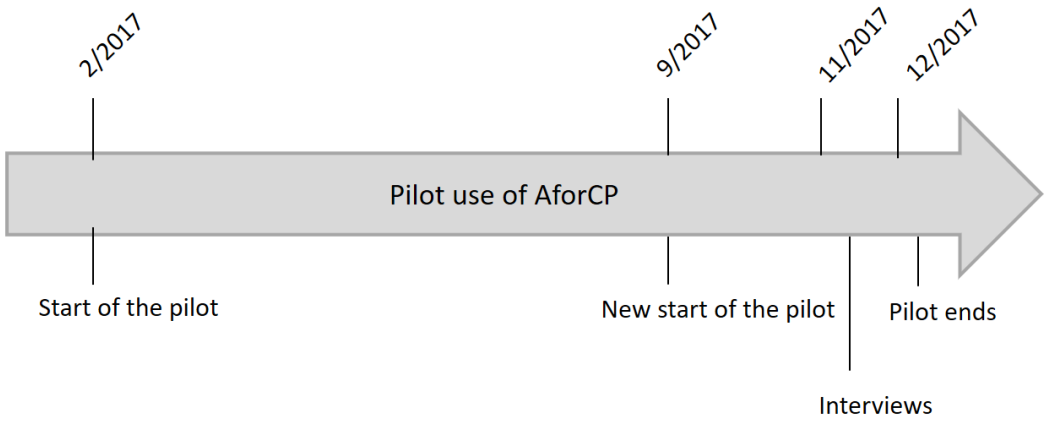

Figure 6. Timetable of the pilot use of the AforCP and theme interviews.

As the Figure 6 visualizes, The City University Hospital Cancer Centre started the pilot use of the AforCP on February 2018. In a few months they noticed that there were not enough patients using the AforCP in order to get a good picture of the benefits of the system. That is why they decided to make a new start for the pilot use. For that purpose, they recruited more professionals, nurses and doctors to users so that this way they could also recruit more patients. The new start was during the autumn, starting approximately in September the same year. All the study interviews were carried out in November. The pilot use of the system was finished in December.

5. Results

This chapter reports the findings that were identified in the analysis of the interviews that were made in a Cancer Centre of the City University Hospital. There were three doctors and two nurses who took part in the interviews. The nurses had about five years of work experience in the Cancer Centre and over ten years of overall working experience. The doctors' working experience was from two to five years as they all were younger than these two nurses. The doctors had been working from two to seven months in the Cancer Centre. Four out of the five of the interviewees were female and one was male. The interviewees had used the AforCP from three weeks to two months. The nurses had used the system daily on their everyday work and he physicians usually used it weekly or a couple of times a week. These interviewees estimation was that there were about 70 patients using the AforCP at that time in the Cancer Centre. They thought it represented approximately 20% of their breast cancer patients using the system. The results are discussed in the following chapters in accordance with the interview themes. The interviewees' personalities, however, are not revealed in the results.

5.1 Healthcare professionals' experiences of the system use

The interviewees were asked what way the AforCP affected their work. They experienced that using the system takes time and it causes additional work. Some of them mentioned that there are times when they would rather call the patient than answers the patient's questions through the system for example in the case that the patient has complex questions. In turn, it was said that the things concerning prescriptions or sick leaves and other simple things succeed easily. Many of them brought up the issue that there was no integration between the main patient information system and the AforCP and because of that, it forced them do double recordings into two different systems. One of the doctors said that there is no specific time for using the system. in addition to that it was said that there is no prioritizing in the system to tell the doctor how urgent the consultation order in question is. One of them also told that when he or she looks at the patient's adverse event report before meeting him or her during the appointment, the background knowledge helps and makes it faster to get to the core of the issue:

> *The AforCP is a pretty nice background for the appointment. It allows perhaps a much faster access to core of the issue when asking about the side effects of patient's chemotherapy treatment*.

The responders considered that doctors' role in the use of AforCP was to be consultative. One of the doctors also thought that the doctors' task was to become acquainted with the patient's adverse event profile prior to meeting the patient. The nurses were supposed to view through the adverse event reports and consult the physicians if needed. They were also supposed to follow the patients' messages in the system, answer them and if they were not able to answer themselves, they had to transfer them to the doctor. Both occupational groups were thought to offer the AforCP for the patients use. One example of the patients' messages to the professionals through the system was to ask about the blood test responses: they may be given more information about the test result.

Four out of five responders mentioned that the implementation of the AforCP had affected their daily working time. The need to record patient information into two different systems was troublesome and it took extra time. They also pointed out that the doctors needed to do more work in order to record all the data. Here are two descriptive examples of the professionals' answers to that question:

> *It has not affected my timing, because there are so few consultations. But if there is when there is a consultation, it always takes more time as it has to be recorded twice to two different systems and then you have to put it separately into your work list. You have to put a separate message to the secretaries that you have worked. So that it can be seen in my day's work list, that I did something here.*

> *I only use the AforCP so my timing has changed. If I also had basic nurses' work, would it reduce phone calls? Since we only have this one patient group, it does not reduce the number of patients in the other patient groups. It might reduce phone calls from those who are using the AforCP.*

Professionals felt that communication with the patients is a bit different when the AforCP is in use. Some of the interviewees called the patients' messages via the system as chatting. They felt that very often the patients used individual sentences and short words that didn't give enough information to the professionals. They also mentioned that these messages gave the patient the opportunity to be in contact with the physician more easily than by phone. That was mentioned as it was too easy to get in touch. As a shortcoming of the system they considered to be the fact that, unlike the phone, the patient's tone of voice could not be heard from the messages in the system. They thought that it is easier to understand what the patients mean if they hear the tone of their voice. Here are two examples of the professionals' thoughts:

> *Simple things can be done easily. If the issue is a bit more complicated, I am not happy to discuss through the system.*

> *Yes, it's a bit chatty. So, there might be thumbs up and smileys. It is such a chatting. Maybe a little lighter than on the phone.*

The interviewees were asked if they could recognize important things about the patient's wellbeing with the help of the AforCP. Four out of five respondents answered that they recognized important things. One of them reported that he did not recognize important things with the AforCP. Adverse events where mentioned in three of the answers as things that can be recognized. The patients' messages may also contain some important information about the patients' general wellbeing. The use of the AforCP had not affected the use or non-use of the patients´ visits. On the other hand, professionals thought that it could be possible to avoid cancellation of the doctor´s appointment or to find out the need for cancelling earlier than without using the AforCP.

Three of the interviewed professionals agreed that it is not impossible to take one control visits out with the help of the AforCP. They haven't done so. They however thought that maybe if the disease is in the metastatic stage and the treatment period will be prolonged, it would be possible to skip one visit. All the responders experienced that they could see the patients' adverse events from the system. Most of them felt that they could recognize the patients' adverse events earlier than without using the system. They don't have other ways to follow their patients' wellbeing and side effects of the treatment, than AforCP, patients' phone calls and their appointments. Some individual

patient's get phone calls from the nurse between separate appointments. The Nurse calls them if they have seen something exceptional in their laboratory results or their treatment is particularly expensive. It was also mentioned in all the professionals' answers that timing data of the adverse event report was not sufficiently clear in the system. They couldn't recognize the timing of the adverse event from the first screen of the report, but they had to open up other views to see the exact time of the adverse event.

Four professionals indicated that the data that the patients record into the AforCP is appropriate. However, two of them mentioned here that the patients send messages through the system more easily than they would call to the hospital instead. One of the professionals told that the patients' recordings are not appropriate; the patients' record all other things that are not related to cancer like something about blood pressure, flu or eczema. Here is an example of what one professional thought of the patients' recordings:

> *Many times, yes. They are more likely to report about their symptoms. I understood that one point here is that the patient regards it as some kind of a diary. In the best case, it may well mean psychological support for her. It should be carefully thought when the content of the message demands the nurse's or even the doctor's consultation. It is okay to have that data there as long as it doesn't force us to react right away.*

The patients' wellbeing is quite easy to perceive by using the AforCP if the patient has filled out the adverse event report. There is, however, one difficulty in the using of the report. The professionals experienced that they could not see from the view of the adverse event report when the adverse event had occurred. They had to search more carefully and go deeper in that view to perceive the exact time of the adverse event.

It was quite hard for the healthcare professionals to say how they experienced the use of the AforCP's when treating the patients, and if they would like to continue using it. As a conclusion from the answers, could be said, that they were willing to continue using it if some changes were made to it. They also thought that the system should be taken into use more widely in the Cancer Centre. The implementation of the current pilot usage did not seem to have served the best way. In the following some interviewees' descriptive answers to the question above:

> *I might not want to continue, if I could decide. Sure, if all the doctors and nurses would use it, but when it's only a few people who are responsible for using it. And yes I guess the idea would be that when a patient comes to a doctor's appointment, then the doctor should go and see from the system whether he has side effects or not. But as there are, as far as I know, only three doctors that use this system, the patients do not necessarily come just to their reception.*

> *I would now like to make a bigger picture of this and as it has, however, worked and has produced good results in Finland. So, it is absolutely modern and it might be useful for us. I am not opposed to its use, but now understandably I feel that that this pilot has somehow burdened this staff more as there is much more to do than before. The general attitude here is a bit negative, so it certainly will affect how I feel about it too. And if there is a clear need for it and it is obvious that it is clearly beneficial to the patient's quality of life and life expectancy, then no doubt.*

The Interviewees were asked how they would describe their satisfaction level when using the AforCP from the user's point of view. Three of them thought that it was hard to say, because they had so short a user experience. Their satisfaction was quite neutral. In that question, two of them brought up the issue of the lack of integration into the main patient information system which forced them to double record the health information of the patients into two systems. The efficiency of the use of the system as well was experienced so that the lack of integration influenced to the experience negatively. The lack of routine of the use of the system also reduced the feeling of the efficiency of the system. Otherwise the system was felt as quite efficient to use. There are two answers to the question of satisfaction level below:

> *I think satisfaction will increase in the future when its use becomes more familiar and easier to use. Now it feels more burdensome, minus winning the pros, but I see potential in it.*

> *I don't know. I guess I am quite satisfied. I can't say yet, so little time has passed that I have no strong opinion about it. But yes, I would use it if it was left for us to use.*

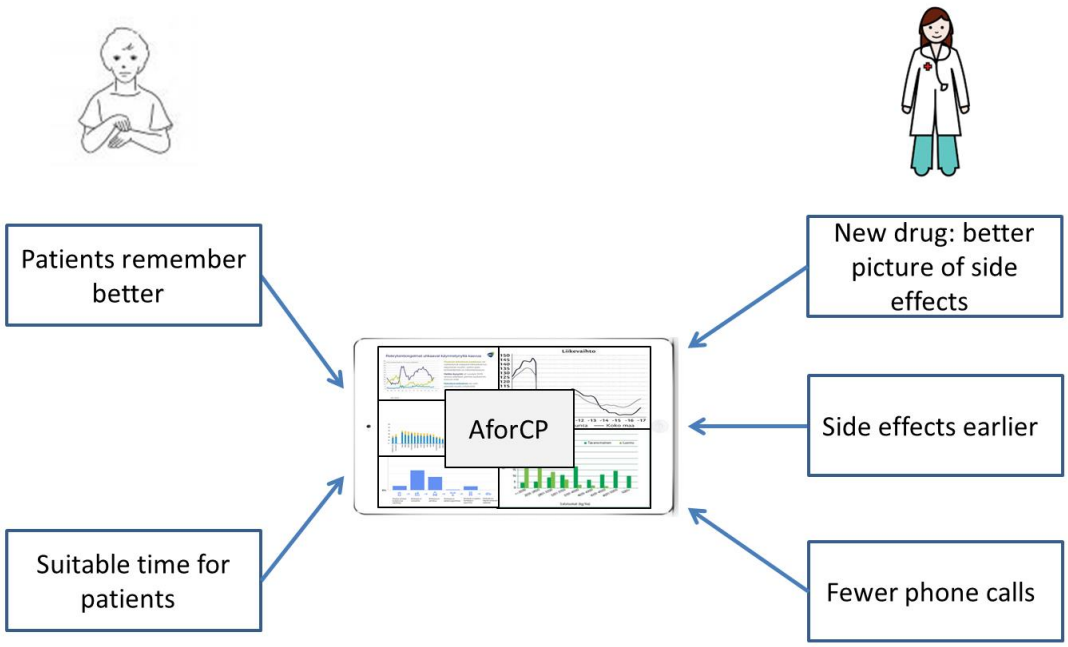

Figure 7. The perceived benefits of the AforCP according to the professionals.

These interviewed health care professionals felt that the perceived benefits of the AforCP are the ones that Figure 7 summarizes. Professionals thought that there would be fewer phone calls from the patients than without using the AforCP. They get to know the side effects of the patients' treatments earlier. The patients are able to record the information of their wellbeing at a more suitable time for them. Patients do not have to remember everything at their hospital visit, and finally when using a completely new drug, the system could give a better picture of the possible side effect.

According to the professionals, using the AforCP, the patients´ treatment processes could be changed or developed. It would, however, require a lot more patients to the

users of the system. The professionals thought that it could reduce the number of the patients' control visits to the doctor.

5.2 Patients' experiences of the use of the system told by the health care professionals

The interviewed healthcare professionals had heard from the patients almost only positive experiences about using the AforCP. One responder thought that this system makes it easier for the patients to ask questions from the professionals. He thought that the patients might consider this to be a good thing. It was also said that the patients are happy to respond to the questions concerning the side effects. The following quotations express the healthcare professionals' thoughts of the patients' experiences:

> *Mainly all the experiences have been positive to those who have agreed to it and actively started using it.*

> *Yes, they really like it. The younger the patient is the more willing he is to use it, of course also older patients are enthusiastic about using it.*

According to the interviewees' opinion, it has been quite easy to make the patients use the AforCP. One obstacle to the use of the AforCP has been the fact that all the patients do not have access to email. One of the responders also commented that some older patients do not feel that mobile application is the way they want to communicate with. They would rather make phone calls if they have something to say to the healthcare professionals. They think that it is easier that way. The interviewees described the obstacles of the use of the system as follows:

> *The patients' lack of e-mail or computer or lack of computer skills are the main obstacles to use the AforCP.*

> *E-mails, when not all these older people and even those born in the 1960s, do not all have emails. One lady gave her granddaughter's email address to receive it that way.*

According to the interviewees, the possibility to use the AforCP application was introduced to the patients receiving neoadjuvant treatment for metastatic breast cancer in the infusion clinic. However, according to them, the use of the system was not proposed to the patients who were born in the 1940s or earlier. For example, one of them reported as follows:

> *Well, if the patient was born for example in the 1940s, I don't offer him the system. Basically, I offer it to younger patients.*

5.3 Implementation of the system

The interviewees were asked how they feel about the expansion of the IT systems in their work environment. They commented that usually the implementation of a new system is usually hard at the beginning, but when you learn to use it, the systems can support your work. The following quotations express the professionals' thoughts:

> *Generally, they are not completed when they are taken into use. I'd like that we could influence on the way they are used. We have also other pilots here, and they have been more or less unsuccessful. And then there is no channel where to give feedback.*
>
> *I guess it is appropriate to use them. They are probably part of the future. I think that's okay.*

There were quite many challenges in the implementation of the AforCP. The interviewees experienced that the project did not progress as it was planned. The start of the project was very slow as there were only a few employees involved in the project. After a half a year new professionals and patients were recruited to use the system. There were also some changes among the employees in the Cancer Centre. At the end of the project there were about 20% of the breast cancer patients that used the AforCP. That was about 70 patients. The interviewees thought that it was too small number of patients and that is why the physicians used the AforCP only a couple of times a week. It meant that they experienced the lack of routine in using it. It was said that the use of the AforCP should have been extended to all cancers, especially into metastatic cancers. If that had been the case, they should have resourced the treatment chain differently said the interviewees.

The interviewees thought that there were some negative attitudes towards the use of the AforCP at the Cancer Centre; especially with those employees who were not involved in this project. Four out of five responders reported that their attitude has turned more positive from the start of the project and one of them reported that her attitude has stayed as open as it was in the beginning. Two interviewees described their attitudes as follows:

> *My attitude was initially negative. It became from the working environment and the fact that I have just started here and this work itself is new to me. But like many things when you become familiar with it, it begins to feel safe. Similarly, also this, my attitude has turned positive. There is also a contradiction in the case. I feel like I'm afraid to say my opinion at the coffee table because there would be a lot of glares. It is, however a group phenomenon that the opinion is unfortunately negative […]h I'm annoyed that certain preliminary set-up in the starting structure of the project has shaped the image of the system. The hatred of the system is not necessarily the result of the system itself, but of the fact that everything may not have been made properly. Thus, the results which can be obtained from this may be distorted.*
>
> *I don't think that my attitude has changed at all. I was quite open already earlier. I would have wanted to be part of this project from the very beginning.*

The responders were asked where they had heard about the AforCP for the first time. They had heard about it from workmate at the morning meeting, at a department meeting, at the AforCP crisis meeting or at a coffee table. Topical issues related to the system were not discussed in the nursing teams. They were mostly discussed in the AforCP meetings with the system's contact person. Responders felt that they did not get much or no support from the management. The users were encouraged to use the system mainly by pushing and saying that it should be used. The contact person of the AforCP had also encouraged people to use the system. There were also some changes in the department management which affected somewhat to the feeling of support. There were

feelings that nobody was clearly leading the project from side of the Cancer Centre. They said that nursing meetings or department meetings did not deal with issues related to the AforCP or the implementation project.

In the question of whether the system is easy to learn to use, the answers varied a lot. Some of the responders thought that it was easy, and others thought it was not easy. Some of them thought that they learned to use it by themselves and others said that learning by themselves was not enough for them at the same time when doing basic work; learning a new system this way was hard for them. Three out of five interviewed felt that they didn't get enough training or not training at all in order to get a better understanding of the use of the AforCP. Two of them felt that they didn't need training, or they had had got enough of it. The following quotations represent two different opinions about the need of the training:

> *I would have wanted training. Personally speaking, it was totally inadequate.*

> *You learn it when you use it. That's my training in practise. There has been only little talk about what the AforCP is. I do not think I would have benefitted from any training even if I had had it from the very begin. It's easy to use and learn by following the menus.*

6. Discussion

The purpose of the study was to find out how health care professionals experience the use of the AforCP mobile application when monitoring their breast cancer patients' wellbeing, the assessment of the symptoms, and the side effects of the treatments. Also, the purpose was to get information of the healthcare professionals' experiences of the implementation of the application.

More and more new patient-reported outcome systems have been internationally taken into use during previous years (Jensen et al., 2014). The number of articles concentrating on the evaluation of the benefits of the use of this kind of systems has been increasing during the last years. Thus, one can assume that the current subject is clearly timely.

Earlier studies give a very positive picture of patient-reported outcome systems. Based on the studies of Basch et al. (2017) and Denis et al. (2017), patient-reported outcome systems can even increase the overall survival time of the cancer patients. According to Basch et al. (2017) the reason for even five months longer survival time is that the side effects of the treatments are recognized and treated in earlier stage. It also means that longer lasting medication is possible in these cases. Also, Denis et al. (2017) emphasized that longer life spans were due to better monitoring of the patients and relapses were recognized in earlier phase. This case study and the interviews concentrated on healthcare professionals' feelings of the benefits of the system rather than the overall benefits of the patient-reported outcome systems. This study supports these earlier studies as it shows how the healthcare professionals got to know the side effects of the patients' treatments earlier than without using the system.

All the responders experienced that they could see the patients' adverse events from the system and when using a completely new drug the system could give a better picture of the possible side effects. Most of them felt that they could recognize the patients' adverse events earlier than without using the system. Interviewed responders don't have other ways to follow their patients' wellbeing and side effects of the treatments than the AforCP, the patients' phone calls, and hospital visits. This case study findings supports earlier research results. This was noticed in the study of Chen et al. (2013) where it was told that professionals are able to better follow-up their patients' responses to their treatments and find more previously unrecognized problems than before patient-reported outcome systems' implementation. As Basch et al. (2017) also showed, with the help of patient-reported outcome systems the side effects of the treatments are recognized and treated earlier.

The interviewed professionals reported that the user interface of the adverse event report of the AforCP was not sufficiently clear. They did not directly see from the first view of the user interface the timing of a particular adverse event. They saw that there was an adverse event, but they could not see if it had happened for example yesterday or a month ago. They had to go deeper in their search to perceive the exact time. The user experience could be improved by making the user interface clearer and more precise. The time of the adverse event should be shown on the first view in the patients' data. Professionals got frustrated when seeking too long a time for information as it caused extra work for them. Pucillo and Cascini also showed in 2014 that it is important that the users do not get frustrated when doing some simple things with the system.

According to Lin et al. (2005), patients value physicians' direct responses to them via portal and think that internet portal lowers the barriers to communicate. In addition, there are many studies that emphasize that patient-reported outcome systems improve communication between the patient and the healthcare professionals (Bennet et al., 2012; Chen et al., 2013; Detmar et al., 2002; Kotronoulas et al., 2014; Rotenstein et al., 2017; Santana & Feeny, 2014; Taenzer et al., 2000; Velikova et al., 2004). It can be concluded from the previous studies that patients value direct responses and internet portals, but according to this current study the professionals do not like the fact that patients can too easily get into contact with them. Professionals felt that patients were more reluctant to contact the hospital through the AforCP than if they had only had the opportunity to call. In addition to this, they thought that there would be fewer phone calls from the patients than without using the AforCP. Healthcare professionals pointed out that the tone of the patient's voice on the phone helps them better understand what the patient means. At the moment it is not possible to get this information via the internet when sending messages. On the other hand, some of the professionals talked about patients' messages and compared them to chat messages. They considered that the messages written in the AforCP were more informal. It was hard to find out what the patient really had in mind, so they had to make separate counter-questions which made them feel like chatting.

This study reveal that the professionals think the patients do not have to remember everything at their hospital visit once they have filled the AforCP before the hospital visit at home. This can be assumed to improve communication between the patient and the healthcare professional as the patient's communication is therefore based on more facts than based on patient's memory. The result confirms the earlier studies' findings of patient-reported outcome systems ability to improve the communication between the patient and the healthcare professionals (Bennet et al., 2012; Chen et al., 2013; Detmar et al., 2002; Kotronoulas et al., 2014; Rotenstein et al., 2017; Santana & Feeny, 2014; Taenzer et al., 2000; Velikova et al., 2004).

Fitzpatrick, Davey, Buxton, and Jones (1998) showed that patient-reported outcome systems can be used to monitor the patient's function ability and wellbeing. One of the main purposes for this study was to find out how the healthcare professionals can follow breast cancer patients' wellbeing. The interviewees answered that the patients' wellbeing is quite easy to perceive by using the AforCP, if the patients have filled out the adverse event report.

Among the respondents' responses, the problem of the lack of integration into the patient information system and, consequently, double-entry in both the AforCP and the hospital's patient information system was highlighted. The users felt that the need to record patient information into two different systems was troublesome and it took extra time. They also pointed out that the lack of integration influenced negatively to the experience of efficiency of the system. Previous studies also highlighted the information integration as an important factor in successful implementation (Greenhalgh et al., 2005; Jensen et al., 2014). Davis (1989) noticed that the user acceptance is the basic criteria for the information system in order to be taken into active use in hospitals. The user acceptance of the information system, on the other hand, arises from the users' experiences of the use and perceived usefulness and the feeling of easiness of the use of the system. (Davis, 1989.) Also, Jensen et al. (2014) highlighted that the healthcare professionals will accept the use of the systems if the integration to clinical health record system is functioning. According to the interviews it can be understood that the lack of integration into the main hospital information system caused frustration among

the professionals as they had to double record the patient data. Probably it was this extra work which caused that the professionals' have negative attitude towards the AforCP.

According to the authors' experience the healthcare professionals appreciate the time spent with their patients. One of the interviewed doctors said that there is no specific time for using the system. The professionals feel that because of the new information system, they do not have as much time to spend on their patients as they had before the pilot was taken into use or alternatively, they have no time outside the patient reception for the use of the system. As Rotenstein et al. (2017) noticed, when the patient-reported outcome system is in use for the first time, it takes extra time from the users. It also adds an extra step to patients' workflows. This case study seems to support these observations.

The idea in this case study was to show how the healthcare professionals experience the pilot project of utilising a mobile application as a supporting tool in the healthcare of breast cancer patients. The pilot use of the application had gone on for nine months before the interviews were carried out. The implementation project by that time had not been as successful as it could have been. Firstly, there were so many recruited patients, for one reason or another, so that the experience in the use could have arisen enough. Subsequently, the attention was paid to the new healthcare professionals being included in the system and after that there were clearly more patients than users. Finally, however, there were approximately 70 patients in the pilot implementation, which was only about 20% of all breast cancer patients using this solution. According to the interviewed professionals, they did not feel routine use of the system as the number of the patients participating in the pilot was that low. That was noticed also in the earlier study of Oghuma et al. (2016) where they emphasized that in order to know the viability of the mobile system, the users need to use the system continually.

The lack of resources in the implementation project is one of the barriers that doctors and nurses face in clinical practise in the implementations projects (Medows, Rogers & Greene, 1998). This studied project was first started with one doctor and one nurse and after about half a year these two professionals made a new start to the project and invited three doctors and two nurses to commit into it. That is a small share of the personnel of the Cancer Centre. According to the interviews, in this Cancer Centre there was treatment process for breast cancer patients where the patients could meet different doctor in every doctor's appointment. As there were only three doctors, who used the AforCP involved in the project, many times happened that the patients using the system met doctors who did not use the system and because of that did not get any benefit from it.

The implementation of a health care information system into health care workflows usually demands some re-engineering of the work processes (Rahimi et al., 2008). Health care processes sometimes range quite greatly from one organisation or working unit to another. If the health care information system is implemented without precise process analysis, it often faces a difficult implementation process. If the system is designed in conjunction with one health care unit, it may not be appropriate for some other unit. According to the author's experience, the health care unit often expects for the system to adapt to their own processes and practices. The implementation of the system may be an opportunity to create more streamlined treatment processes. On the other hand, when the organisation is planning to purchase an information system, it is necessary to consider if the system supports the operating model being used in their organisation. According to earlier study of Robey et al. (2000), it is typical that the

introduction of a new information system in an organisation is related to the change process that the new information system is intended to support. In this pilot case, according to the interviewed professionals, possible changes to the processes would have helped the usage of the system and could be concluded that the real benefit of the system did not come out for this pilot.

In this study the usage of the AforCP was not proposed to those patients born in the 1940s and earlier. It was not asked why it was done this way. Was it because of the idea of that possibly older people are not as experienced in using IT solutions and willing to use them, or they may not have as many possibilities to use them because they might not have needed devices. However, Basch et al. (2016) showed that the patients who had less experience in using computers had better benefit from electronic systems as it is shown in figure 2. Furthermore, when analysing the usefulness of the system it might be important to have clearly more patients in the study group.

Rahimi et al. (2008) and Yucel et al. (2011) emphasized the commitment of the project organisation in the implementation process. In this study it was noticed that the project organisation in the hospital was quite compact. There were only five users and apparently no project manager who would have been discouraging the users to take the system into use. Earlier studies show how the user involvement and commitment into the implementation process is needed in order to succeed in the implementation project (Bansler & Havn, 2010; Berg, 2001; Rahimi et al., 2008; Yucel et al., 2011). The project organisation as well should be well committed in to the implementation project (Rahimi et al., 2008; Yucell et al., 2011). According to these interviews it can be assumed that some of these interviewed healthcare professionals experienced that they had been directed to participate in the implementation project and in the usage of the system. Although, one of the responders from the early phase wanted to be part of the project, most of them indicated that participation in the project was not exactly their own choice. So, it can be assumed that the user commitment was not reached very successfully. It seems that it is important for the users to clarify the reasons to the implementation and the project would be good idea to try to “sell” the project to the professionals. So that the users could have better understood the basic reasons for the implementation of the AforCP system, the expected benefits and reasons for the implementation of the system would have been better explained to the users

Based on the interviews, the interviewed doctors were in the early stages of their careers. Their work experience at the Cancer Centre had not lasted longer than a few months and their overall work experience not more than a few years. One of the respondents said that she also had a bit of learning about the use of the patient records system, so the use of the AforCP's added a challenge to his learning and managing the work. As Benner’s (1989) model ” From Novice to Expert” suggest for nurses from early stage of their career. It takes two to three years to reach the expert level from a beginner.

In the interviews it was emphasized by the interviewed professionals that the atmosphere at the workplace was against the AforCP system. Some of the interviewees thought that they did not dare to express their own positive opinion about the system at the coffee table discussions because there was so much resistance against the AforCP. Also, according to Verkatesh and Davis (2000), after the users get more experienced with the system, they don’t mind what other people think about the perceived usefulness or intentions of the use of the system. They however, judged the usefulness of the system if they got status benefit from it. In other words, in this study, it looks like the

interviewed professionals' experiences of using the system were so short that they were vulnerable to the influence of other co-worker's opinions. The interviews were conducted fairly at the time when these professionals had used the AforCP for only a maximum of two months. Thus, it seems like the time that users had used the system and the resistance from some professionals that didn't use the system may have affected the image that interviewed users felt about the system. After all, the interviewees thought that they wanted to continue using the system with some changes in operation. The patients in this study were not asked about that but in earlier studies patients have been willing to continue using these kinds of systems in their routine care (Cleeland et al., 2011; Velikova et al., 2010).

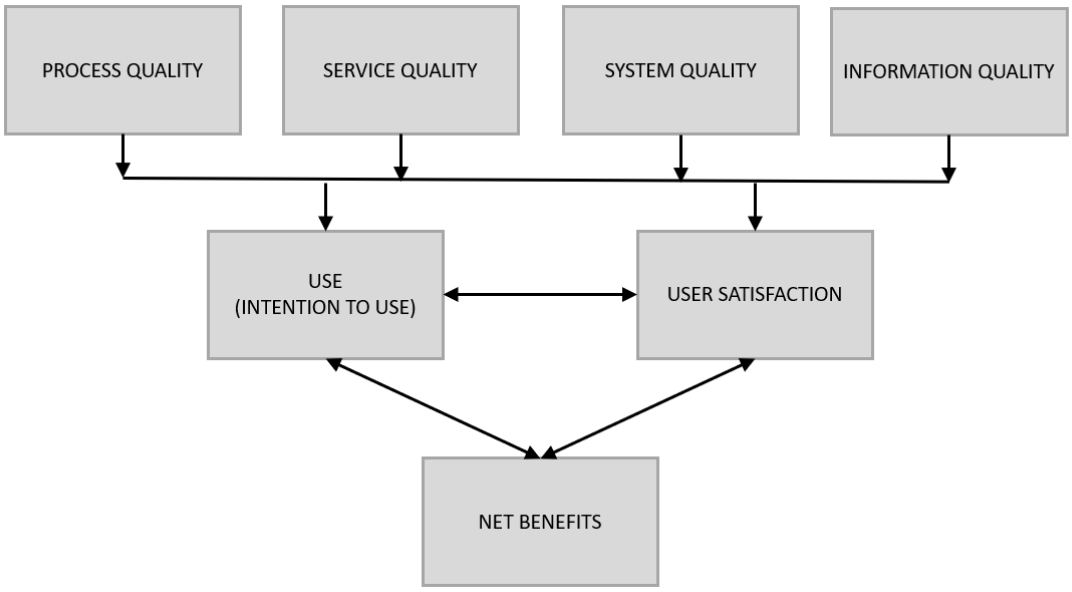

Figure 8. Model for net benefits of the patient reported outcome system.

The Reformulated IS Success model was introduced by DeLone and McLean in 2002. The results of this study can be evaluated in accordance with this model. In order to be able to evaluate Net benefits of the system, you need to find out the Intention to use and the User satisfaction of the system. According to the Reformulated IS Success model they consist of Service quality, System quality, and Information quality. (DeLone & McLean, 2002.)

Based on the results of this study, the model has been modified so that Process quality has been added as one essential point of view (Figure 8). Process quality here refers to the quality and functionality of the organisational processes from the point of view of the use of the information system. According to the author's experience, it is particularly important to integrate the development of organisational processes with the processes of the system so that the processes of the system fit the processes of the organisation. That has important affect to the user satisfaction and intention to use the system, and into the net benefits of the system. Also, according to the interviewed professionals, possible changes to the processes would have helped the usage of the system. It was stated in this study that in the pilot organisation the work of the health care professionals was organised so that the doctors and patients using the system only met occasionally. The patients did not meet the same doctor each time they visited the cancer centre. Therefore, the way the work was organised in that cancer centre had a significant effect on the AforCP´s net benefit.

In this system`s regard, Service quality has appeared so that not all users have experienced sufficient training. The users, however, felt that they were able to get help from the supplier of the system, which was why they felt they managed the use of the system well enough. The experience with System quality was influenced by the fact that there was no integration between the AforCP and the main health care information system in the hospital. This was regarded as a major problem. System errors were not mentioned in the interviews. One especially important functionality was found to be missing; information on the time of adverse events. There were varying experiences in Information quality. Patient information was obtained from the system on time and the data on the adverse effects were considered relevant. On the other hand, the messages sent through the system were partly seen as some chat. Incomplete information was here considered a problem with chat. According to the model, these experiences generate Use (Intention to use) and User satisfaction.

The physicians used the AforCP only a few times a week. The nurses surely used it much more. The health care professionals had more intention to use than they eventually managed according to the pilot project plan. It was largely due to Process quality. The users were reasonably satisfied to use of the system (System quality and Information quality), although the lack of integration and the appearance of the time of the side effect information caused dissatisfaction. From the point of view of user satisfaction, it can be considered a positive experience that the existence of system errors was not brought up in the interviews.

The final Net Benefit comes from use and user satisfaction. The cancer centre had to make a decision to continue using the AforCP system with relatively little experience. The scarce number of patients and health care professionals using the system was a major challenge. Net benefit can be said to have been negative because the cancer centre decided to stop using the AforCP system after less than a year of experience. However, the organisation may consider the user experience of this type of system as an important benefit. As in the future, patient reported outcome systems will likely become more common.

The purpose of this study was to find out how healthcare professionals experience the use of an application, called the AforCP in this study, when monitoring their patients' wellbeing, the assessment of symptoms and side effects of the treatment. The idea in the study was also to clarify how the healthcare professionals experienced the pilot project of utilising a mobile application as a supporting tool for healthcare of breast cancer patients. The goals in the study were well achieved, although it did appear that according to this study, the challenges related to the implementation of the system impact on healthcare professionals' experiences in many ways.

7. Conclusions

The purpose of this study was to analyse how healthcare professionals' experience use of the mobile application called AforCP at the hands of their breast cancer patients. Also, the purpose was to find out how the implementation of the application was experienced.

When the findings of previous studies concerning the benefits of the patient-reported outcome systems are compared to the results of this study, it can be concluded that there is just scarcely available information about the healthcare professionals' experiences of the benefits of such systems. The previous studies largely focus on the benefits from the patients' point of view.

Using this system, the professionals thought that there would be fewer phone calls from the patients than without using the AforCP. They get to know the side effects of the patients' treatments earlier. The patients are able to record the information of their wellbeing at a more suitable time for them. They do not have to remember everything at their hospital visit, finally when using a completely new drug, the system could give a better picture of the possible side effect. This study did not show that the communication between the patients and the professionals would have worked better, even though many previous studies strongly supported it. Instead, according to this study, healthcare professionals felt the use of the system to increase chat messaging, which they did not feel completely meaningful.

There were quite many challenges in the implementation of the AforCP. The interviewees experienced that the project did not progress as it was planned. The start of the project was very slow as there were only a few employees involved in the project. After a half a year new professionals and patients were recruited to use the system. There were also some changes among the employees in the Cancer Centre. At the end of the project there were about 70 breast cancer patients using the AforCP. The interviewees thought that it was too small number of patients and that is why the physicians used the AforCP only a couple of times a week. It meant that they experienced the lack of routine in using it. It was said that the use of the AforCP should have been extended to all cancer caces, especially into metastatic cancers. If that had been the case, the management should have resourced the treatment chain differently, the interviewees said.

In the early stages of the study, it was intended to use project material as a source of information in addition to the professionals' interviews. However, the researcher did not get the project material from the organisations. The description of the project is based on the interviews and verbal information from the cancer centre. The project material would have brought a second dimension to this case study and it could have strengthened the credibility of the results of the study.

As this was a case study, the results of the study cannot be generalized in other environments. In particular, there is considerable amount of differences in therapeutic processes between various hospitals, whereby the perceived benefits of a particular information system may vary a lot. In addition, the system users who were interviewed for this study had only used the AforCP system and for a very limited time period. Because of that, the user experiences were not from a long period of time. That may have affected the healthcare professionals' experiences of the use of the system. As this

pilot project had a limited timeframe it was not possible to postpone the interviews. It would have been interesting to see whether the experiences would have been similar or whether they would have changed if the system was used for a longer period of time.

All the professionals except two that used the system during the pilot were interviewed for this study. Therefore, in the context of this implementation project, the validity of the results could not have significantly increased by increasing the number of interviewees from five to seven. Execution of the first interview before the pilot implementation could have added some depth to the results of the survey. In that case, it would have been possible to have results that would have shown even more deeply the change of the user experience in some important aspects of the study. Similarly, it would have been interesting to interview the same professionals again after longer period of time of the use of the AforCP. That would have shown how the professionals' experiences of the use of the system would have altered when the experience and the expertise would have increased.

As in this pilot implementation the healthcare information system was not integrated into the hospital's main information system, it required additional work from the healthcare professionals. Especially the doctors thought that additional computer work, like double entries of the patient information was unnecessary and therefore their attitude towards the implementation of the systems was often sceptical. In the future, however, the use of artificial intelligence will make it possible for physician to obtain more detailed summaries of the progress of the treatment of each patient. This would facilitate the approval of the system, especially as it would save working time.

In the future, the reporting applications of the patient-reported outcome systems will be developed. It is interesting to see how more developed artificial intelligence will change the use of these systems. At least it can be presumed that with artificial intelligence, the benefits of these systems will become more significant. Artificial intelligence may better predict the development of patients' wellbeing or the appearance of adverse events in different forms of the treatment. Predictive analytics help developing treatment processes and help optimize the treatment. This opens up many new perspectives to explore the benefits of these systems.

Patient-reported outcome systems enable different real-world evidence studies to evolve to a new level. As the applications are developed, significant additional information will be available from the efficiency and the side effects of different medications used by the patients. Furthermore, the chances of health economics and pharmacoeconomic research will be at a new level as the amount and quality of real world data will be growing. In this case it is also possible to collect the information of the quality of life of the patients in order to make more qualified cost-effectiveness analysis possible. More developed information can also be obtained of what patients will benefit the most from expensive medicines and medical treatments. These developments may also influence to the benefits that professionals experience from the use of the systems. More research is needed to have health economical cost-effective knowledge to support the usage of these systems. It is important to discuss the information collected with the professionals, so that they could more easily accept their role in using these systems.

In the future, it will be crucial to find out what information is important to gather in order to develop the optimum treatments of the diseases of the patients. The development of an individual pharmacotherapy, especially for expensive medicines, will be possible by a new way through patient-reported outcome systems. It is also

important to be able to find out which patients are most affected by the treatments' side effects in order to develop the most beneficial treatment for the patients. In order to make the healthcare professionals see the benefits of developing treatments, which is essential for their work, it is important that, when the systems are implemented, or their features evolved, the reasons for collecting certain information should be opened up to the healthcare professionals.

The use of this kind of patient-reported outcome system may be useful in many other cancer treatments than just breast cancer (e.g. prostate cancer). The treatment and care of other diseases like diabetes or rheumatoid diseases or other chronic diseases good also benefit from this kind of patient-reported outcome system. Furthermore, it may be important when analysing the usefulness of the system to have clearly more patients in the study group.

Until now it seems that the articles in medical journals concerning patient-reported outcome systems are mainly published by oncologists as the main researchers. Therefore, those articles seem to concentrate on the benefits of cancer patients and their treatments. In this study the professionals' experiences of the use of the system were viewed. This also viewed patients' experiences of the use of the system told by the professionals'. That was an approach which was not found in the earlier studies. This kind of topic concerns in addition to oncologists also information system developers and researchers. In the future, the role of the information system researchers may get stronger and more significant as the artificial intelligence develops.

These patient-reported outcome systems should be further developed so that the professionals would more easily accept the use of them. It seems that the professionals would not like to communicate enough with the patients or that they experience that they do not have time for that. It would be important to have a feature in the system where the patient can report how urgent the professionals contact is. That could reduce the professionals' feeling that the patient can too easily and direct get contact with them.

The implementation of the patient reporting system seems to be of great importance to the usability of the system experienced by professionals. Planning the implementation requires project workers to investigate the need for change in the functionality of the system and required operating processes. In order to get the best possible benefit from the system, the evaluation of the process and necessary changes should be carried out in a controlled manner during the implementation. The commitment of the project staff and users of the project is particularly important when implementing the new system. In addition, the internal management of the project should be well organised, and the project resourced at an adequate level. It is also important for the users to be able to clearly point out the benefits of the system to be implemented in order to create the most enjoyable atmosphere for the future use of the system.

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Appendix A. Interview questions

1. Are you a physician or a nurse?
2. How long is your work experience? How long have you worked in the Cancer Center?
3. How do you feel about the expansion of the IT systems in your work environment?
4. How long have you been using the the AforCP?
5. How often do you use the AforCP? (daily, weekly, monthly?) If you do not use often, why not?
6. Assess how many of your patients use the AforCP? Amount / percentage
7. How did you find out about the AforCP? (superior, intranet, AforCP ...?)
8. In which forums does care team discuss topical issues related to the AforCP?
9. What way have the users been encouraged to use the AforCP in their work?
10. What have the patients told about their experiences with the AforCP?
11. What is your feeling about the willingness of the patients to use the system? Is it easy or difficult to make patients the AforCP users? What are the obstacles of using the AforCP?
12. Which patients are the AforCP offered for? Is it possible for all patients to use the AforCP if they wish?
13. What way has the AforCP affected your work?
14. How do you feel: what is the physician's role or task with AforCP? How about the nurse's role?

15. Has the implementation of the AforCP affected to your daily working time?
16. Do you feel that communicating with the patient is different when the AforCP is in use? eg. telephone, e-mail, reception
17. Do you feel that important things about the patient's wellbeing have been recognized with the help of the AforCP?
18. Has the use of the AforCP affected the use or non-use of the patients´ visits? Would it be possible to avoid the cancellation of the doctor´s appointment or to find out the need for cancel earlier than without using the AforCP?
19. Does the AforCP make it possible to withdraw some patients´ visits or postpone them? Is it possible to withdraw some control visits with the AforCP?
20. Are you getting information about the adverse events of the treatment? If you do get, do you get it in earlier stage than normally? Do you notice serious side effects with the AforCP in a timely manner?
21. Do you have other tools or procedures that you can use to monitor changes in patients´ wellbeing at home and the side effects of treatment? How is the monitoring done with the patients with whom? the AforCP is not in use?
22. Is the data that patients record into the AforCP appropriate?
23. How well do you perceive patients´ wellbeing by using the AforCP? Do you find it easy or difficult?
24. How do you experience the use of the AforCP's when treating a patient? Would you like to continue using the AforCP?
25. How would you describe your satisfaction level when using the AforCP from the user's point of view?
26. Is it easy to learn how to use the AforCP?
27. Is the use of the AforCPn efficient? Why is it or is not?
28. What benefits do you or your work community gets from the AforCP?
29. Have you noticed any deficiencies in the records that the patients have made in

the AforCP? If so, what?
30. Do you interview the patients in the same way regardless of whether they use the AforCP or not? Does the use of the AforCP affect the duration of the interview?
31. What way have you connected the information produced by the patients through the AforCP to the existing data?
32. Have any other changes in your work environment occurred at the time of the launch of the AforCP? Do you think they had an impact on the AforCP's start up?
33. Does the AforCP change the patients´ treatment processes, what way? Can the treatment process be developed with the help of the AforCP? How?
34. Would you express your idea why you started using the AforCP in the Cancer Center?
35. How do you experience the support of the introduction of the system got from the hospital management, the director of the nurses? Chief physician?
36. What are the positive and negative feelings that the AforCP has brought in you and your colleagues?
37. Have you received adequate training for the use of the AforCP?
38. Was the launching process of the AforCP as it was originally planned?
39. What way has your attitude to the use of the AforCP changed during the use? What things have changed your attitude?